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**ARMY USAGE MANAGEMENT POLICY
FOR
INSTALLATION EQUIPMENT**

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U.S. ARMY INDUSTRIAL ENGINEERING ACTIVITY

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) Current Army policy--as contained in Chapter 4 of AR 71-13, Army Equipment Authorization and Usage Program--generally requires that utilization data be collected and reported on individual pieces of capital-type equipment. The reporting basis is percent days in which the item is used per quarter, with 25 percent being the typical minimum standard. Items not meeting the minimum standard may be exceeded. The study attempts to show that the policy is not supportable in a modern production environment, especially one with such features: as cellular manufacturing and Manufacturing Resource Planning. Analysis and use of process data--e.g., production quantity, processing time, setup time, cycle time, and machine idle time--should override standard, regulation-mandated requirements for equipment utilization. Federal Acquisition Regulation (FAR) and Defense Logistic Agency (DLA) supplemental procedures do a good job of recognizing advancements in production control techniques. The study concluded that Government-operated maintenance shops, industrial plants, proving grounds, and laboratories should manage utilization of their equipment along the lines of FAR and DLA policy.					
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EXECUTIVE SUMMARY

The purpose of the study was to develop Army Installation Equipment usage management policies that are consistent with the latest accepted business and engineering practices. Current Army usage policies are contained in Chapter 4 of AR 71-13, Army Equipment Authorization and Usage Program. The chapter generally requires that utilization data be collected and reported on individual pieces of equipment. The reporting basis is percent days in which the item is used per quarter, with 25 percent being the typical minimum standard. Items not meeting the minimum standard may be exceeded (page 5).

AR 71-13 contains numerous and conflicting exemptions. For example, it exempts high-dollar value machine tools, Industrial Plant Equipment (IPE), from usage data collection and reporting, but it goes on to say that metering devices should be installed on IPE (page 4). It exempts Government equipment furnished to contractors from its provisions and then immediately states that AR 71-13 requirements should be included in contract scopes of work. It also exempts all equipment purchased with Army Industrial Fund (AIF), Production Base Support (PBS), and Research, Development, Test, and Evaluation (RDTE) funds, but, in an appendix, it says that certain, very common types of equipment will have utilization data reporting, regardless of the funds used.

A review was made of several books on manufacturing management (pages 12 to 28) and of Federal, Defense Logistics Agency (DLA), Air Force, and Navy equipment utilization policy (pages 8 to 11). The Toyota Production System provides a good example of the latest accepted business and engineering practices with regard to utilization. Toyota collects performance data on a daily basis for each manufacturing process or machine. The performance data includes: production quantity, process time, setup time, cycle time, and idle time. Monthly data is compared to the monthly production plan. If there are unfavorable variances, remedial action taken. Actual performance data is also fed back for use in planning the next monthly period. Data collected over three months is used to highlight technical differences between processes and between capacity-utilization rates for individual processes. Toyota ultimately uses the data to promote company-wide improvements in engineering techniques (page 22).

The study concluded (page 29) that:

- (1) The Army Equipment Usage Management Program as presented in Chapter 4 of AR 71-13 does not reflect modern business and engineering practices.
- (2) The equipment usage standards contained in AR 71-13 are not supportable in a modern production control environment.
- (3) The Federal Acquisition Regulation and DLA supplemental procedures better recognize and are more compatible with advancements in modern production control techniques than AR 71-13.

(4) Army equipment usage management policy should permit installations to develop their own equipment usage standards that depend upon individual circumstances.

(5) Equipment utilization data is a recognized necessity for production control.

(6) An ideal approach to equipment authorization involves looking into the future instead of emphasizing past history. The capacity Resource Planning (CRP) element of Manufacturing Resource Planning (MRP II) provides the necessary tools.

The principal study recommendation was to revise Chapter 4 of AR 71-13 along the lines of the Federal Acquisition Regulation and DLA procedures (page 30). Twenty-one specific changes were proposed (Appendix 2, pages 32-42).

Army Usage Management Policy for Installation Equipment

1. **PURPOSE.** The purpose of this study is to develop Installation Equipment utilization management policies that are consistent with the latest accepted business and engineering practices. The study is in response to a request by the Equipment Management Division of the Army Materiel Command (AMC) Installations and Services Activity (I&SA), Rock Island, IL.

2. **METHODOLOGY.** The basic methodology for the study consisted of the following steps:

- a. Review current approaches to equipment utilization management.
- b. Identify any problem areas with existing Army policy and procedures.
- c. Develop, where necessary, proposed new concepts for the Army.

3. DEFINITIONS.

a. Plant Equipment means personal property of a capital nature used in manufacturing supplies, in performing services, or for any administrative or general plant purpose. It includes equipment, machine tools, test equipment, furniture, vehicles, and accessory items. It does not include Special Tooling and Special Test Equipment (reference Federal Acquisition Regulation (FAR 45.101)).

b. Industrial Plant Equipment (IPE) means Plant Equipment in Federal Supply Group 34 with an acquisition cost of \$15,000 or more used for cutting, abrading, grinding, shaping, forming, joining, heating, treating, or otherwise altering the physical properties of materials, components, or end items (reference DOD FAR Supplement (DFARS 245.301)).

c. Other Plant Equipment (OPE) means all Plant Equipment not classified as IPE (reference DFARS 245.301).

d. Installation Equipment (IE) means all nonexpendable equipment of an installation or activity. IE excludes real property, items under test, fixed plant equipment, communications equipment, and nonappropriated fund property, (reference AMCR 700-64).

4. DISCUSSION

a. Army Equipment Usage Management.

(1) AR 71-13.

(a) Chapter 4 of AR 71-13, Army Equipment Authorization and Usage Program, prescribes an overall Army Equipment Usage Management Program. It also prescribes usage standards for certain types of equipment. The chapter

applies to all active activities and installations managed under Table of Distribution and Allowances (TDA) rules. However, it specifically exempts thirteen broad categories of equipment from the provisions of the chapter; the exemptions that relate to Plant Equipment are as follows:

- Government-furnished equipment. Usage of Government equipment furnished to contractors is governed by the FAR and its supplements.

- IPE. IPE is exempt from usage data collection and reporting, but walk-through procedures are to be used to identify unused or seldom used equipment. Documented walk-throughs are to be conducted by the installation commander and the equipment managers at least semiannually, and undocumented walk-throughs are to be conducted by the equipment manager at least monthly.

- Equipment used in direct support of Research, Development, Test, and Evaluation (RDTE) missions. Walk-through procedures apply.

- Inactive, laidaway Plant Equipment Package (PEP) equipment. If the equipment is removed from a PEP or is removed from layaway, then utilization data collection is required unless otherwise exempt.

- One-of-a-kind equipment. One-of-a-kind equipment is defined as being that one and only specific type of equipment located on an installation. It is to be monitored during higher headquarters' reviews of installation logistics or equipment management.

- Installed equipment. Utilization data collection is not required for equipment such as generators and compressors which are part of the real property facility.

(b) The policy paragraph of Chapter 4 starts with a statement that: "Minimum quantities of equipment will be acquired and retained to perform the assigned mission in the most cost effective manner." The statement means that, for example, an installation machine shop may retain the machine tools needed to perform the jobs at hand, regardless of any established minimum equipment usage standards.

(c) The study found several contradictions in the policies of Chapter 4:

- Chapter 4 exempts certain equipment from the provisions of the chapter, yet it requires walk-through reviews for some of the exemptions.

- It states that metering devices should be installed on active IPE, an exempt category.

- It states that all types of equipment listed in Appendix G of the AR will have utilization data collection and reporting, regardless of the funds used to procure the equipment (e.g. RDTE, Production Base Support (PBS), and Army Industrial Fund (AIF)). However, paragraph 2-3 of AR 71-13

allows equipment procured with RDTE, PBS, and AIF funds to be exempt from TDA procedures and, by implication, from Chapter 4. In addition, Appendix G gives minimum and objective quarterly usage standards for IPE-type equipment such as band saws, lathes, milling machines, and drilling machines.

- It exempts Government equipment in the possession of contractors, and, immediately afterward, it states that AR 71-13 requirements will be included in contract scopes of work.

(d) The procedures of Chapter 4 require that monthly usage and availability data be kept for each item on a local report. Quarterly consolidations are to be made, and four quarterly reports are to be kept on file for use during inspections and reviews by higher commands. Copies of the reports are to be submitted as part of the justification when requesting additions of similar items to the installation TDA. Equipment usage data may be compiled by automated means such as the AMC Installation Equipment Management System (IEMS), controlled by I&SA's Equipment Management Division.

(e) The usage standards for IPE-type equipment are 25 percent minimum and 50 percent objective, on a quarterly basis. To compute the quarterly use percentage, the installations are to count the number of days during which the equipment was operated per quarter, multiply that number by 100, and then divide the product by the number of work days in the quarter.

(f) Appendix G of the AR states that when individual pieces of equipment fail to meet the minimum standard (25 percent), then an analysis needs to be done. The analysis should consider equipment rotation, pooling of similar pieces, and/or reducing TDA authorizations (excess the piece).

(2) AR 700-90. The new AR700-90, Army Industrial Base Program, dated 1 April 1992, no longer contains general procedures for IPE or equipment management.

(3) AR 700-43. AR 700-43, Management of Defense-Owned IPE, contains no guidance about IPE usage management. However, paragraph 20501 requires that IPE be reported to the Defense Industrial Plant Equipment Center (DIPEC) by the last user within 15 working days after becoming idle (excess to contractual or mission requirements and available for DIPEC redistribution). Appendix 1C lists status codes to be reported on DD Form 1342, Property Record, whenever IPE is acquired, is moved to a new location, changes active/inactive status, or is declared idle. Commonly used status codes by the Army are:

<u>Status Code</u>	<u>Description</u>
1A	Active.
1B	Active and earmarked for a PEP.
1P	Reactivated PEP item.
3D	Inactive, laidaway PEP item.
3H	An item in a Government-Owned, Government-Operated (TDA-type) installation or activity, subject to intermittent use, and required to support the assigned mission.

(4) AMCR 700-64.

(a) AMCR 700-64, Installation Equipment Management Program, applies to AMC installation equipment as defined in paragraph 3d above. The AMCR outlines the following responsibilities pertinent to this study:

- The command equipment manager (exercising staff oversight of equipment managers at subordinate installations).
 - Assures use of interservice or commercial maintenance to the maximum extent practical and of equipment rentals as appropriate.
 - Ensures full cognizance of advanced technology in the operation, maintenance, and replacement of IE.
 - Validates retention of IE not meeting usage standards.
 - Promotes pooling of intermittent and multiuser items.
 - Ensures that equipment maintenance activities (machine shops, allied trade shops, and model shops) are consolidated managerially and physically to the maximum extent possible.
- The equipment manager at each installation.
 - Develops and carries out an equipment usage management program in accordance with Chapter 4 and Appendix G of AR 71-13.
 - Ensures validity of justifications for retention of equipment not requiring utilization data collection, e.g., one-of-a-kind equipment.
 - Reviews quarterly usage reports, rotating equipment where required.
 - Monitors equipment utilization by conducting walk-throughs for equipment not identified in Appendix G of AR 71-13.
 - Ensures valid requirements for equipment not meeting usage standards.
 - Promotes pooling of intermittent and multiuser items.
 - Establishes a pool of intermittent and multiuser items for the purpose of improved usage and reduced inventories.
 - Develops a procedure to review pool usage annually to identify excess items. The AMCR states flatly that, for pooled items: "Equipment not having three demands in 180 days will be excessed." Equipment with more than three demands but not meeting the usage standards (used less than 25 percent of the days the quarter) can be justified in writing for retention to the equipment manager.

●● Assures that all installation IPE is maintained under property book procedures. Note that Plant Equipment at a GOGO is normally documented for accountability purposes on the property book. It is not necessarily documented for authorization purposes on the TDA. The TDA and property books are two separate things.

(b) AMCR 700-64 specifies use of a standard, automated AMC Installation Equipment Management System (IEMS) for all installations, activities, and laboratories except GOGO activities. IEMS includes the functions of item identification, property accountability (property book), hand receipts, authorization, maintenance, and utilization. AMC Form 2813, shown as Figure 1, is used to record and report equipment utilization.

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INSTALLATION EQUIPMENT MANAGEMENT SYSTEM (IEMS) PRODUCTION AND SERVICES EQUIPMENT (P&SE) UTILIZATION RECORD (AMC-R 700-64)																		RCS AMCEN-1004	
LOCAL ID NUMBER		BAR CODE NUMBER		EQUIPMENT STOCK NUMBER				EQUIPMENT SERIAL NUMBER				HAND RECEIPT NUMBER							
SHORT NOMENCLATURE				USER COST CONTROL NO.				ENDING MTR RDG				STARTING MTR RDG				DATE UTIL			
ANC CODE	PSBL DAYS	DAYS USED	DAYS IDLE	DAYS NONAVAIL		LOCATION								WORK ORDER NUMBER					
DAYS IN-USE/IDLE/NONAVAILABLE																			
WK NO.	SA	S	M	T	W	TH	F	WK NO.	SA	S	M	T	W	TH	F	LEGEND			
1.								4.									DAYS IN-USE "U"		
2.								5.									DAYS IDLE "I"		
3.																	DAYS		
																	NONAVAILABLE "N"		

AMC FORM 2813
1 SEP 90

Figure 1. AMC Form 2813.

(c) AMCR 700-64 concludes with a suggested organizational structure and detailed function statements for managing equipment at AMC installations. See Figure 2 below for the organizational structure, which may be reduced or expanded consistent with the size and complexity of the installation mission.

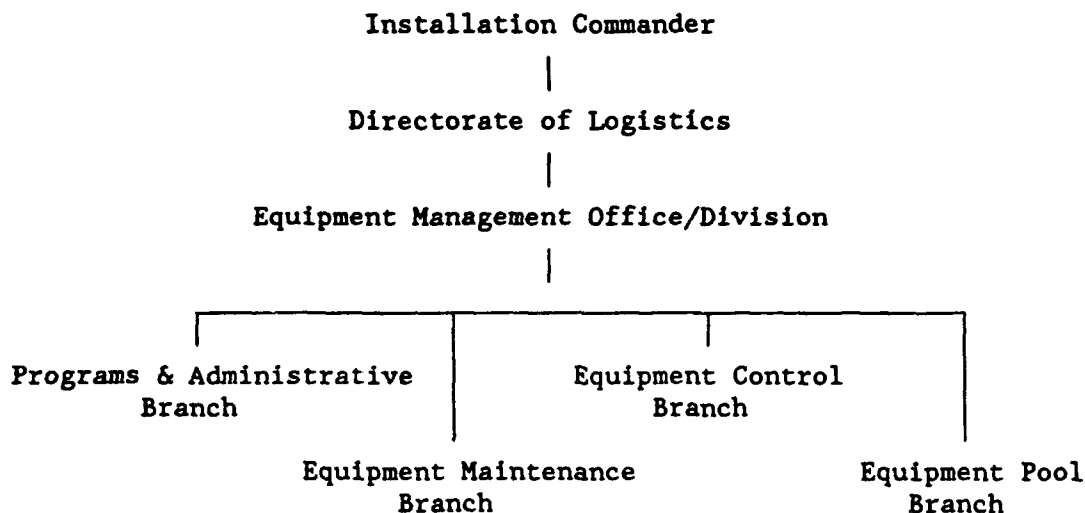


Figure 2. Typical Organizational Structure.

b. Navy Underutilized Property. The Navy Comptroller Manual, Volume 3, Chapter 6, states that naval shore facilities may retain the minimum essential plant property necessary to support general operations and assigned missions. The shore facility must review infrequently used or underutilized plant property (used less frequently than once every 90 days) and justify continued retention. If they determine that an item is underutilized but that it does support an assigned mission, they classify it as a "mission support" item and record the fact on the item's property record by entering a status code of "3H" (refer to paragraph a(3) above). The shore facilities maintain property records for mission support items separately from active items, and they review mission support items for retention or disposition during triennial inventories.

c. Air Force Equipment System.

(1) AFLCM 78-165, Depot Maintenance Equipment Program--G017 Users Manual, describes a rather elaborate Air Force data processing system for managing existing Plant Equipment and for processing equipment requirements. The G017 system performs the following functions:

- Reviews equipment condition and capability for replacement considerations.

- Determines if equipment is incurring excessive downtime and is being used effectively.
- Reports annual depreciation.
- Obtains visibility of the investment in and condition of equipment by custodian.
- Determines if acquisition of a new piece of equipment is the most economical of feasible alternatives.
- Projects future equipment investments in a budget year requirements summary.
- Determines the status of equipment requirements going through the budget process.
- Ensures that equipment identified for replacement is turned in upon receipt of new equipment.

(2) The system produces an Industrial Equipment Utilization/Downtime List--Part II that the equipment custodians use to annotate utilization and downtime data for their machines on a monthly basis. For equipment utilization, the custodians have the option of entering end of month meter readings or manually recorded actual times. For downtime, they use manually recorded times. The system also has a Part I listing that outputs utilization and downtime data for the last month and for the total machine history.

(3) Reports from the G017 system are used mainly at the installation level. Higher headquarters personnel have access to data in the system, but they do not routinely receive all output reports.

(4) The Air Force does not have equipment usage standards. Instead, AFLCM 78-165 provides general guidance:

"The occurrence of excessive downtime or less than effective use of expensive industrial equipment must be identified. Management decisions should be made regarding the replacement, retention, or relocation of equipment. Low usage alone doesn't mean less than effective usage of essential industrial equipment"

d. Federal Acquisition Regulation (FAR) Provisions.

(1) FAR 45.509-2, Use of Government Property, contains equipment utilization policy for Government contractors. The FAR paragraph requires that a contractor have written procedures to assure that Government property will only be used for purposes authorized in the contract and to provide the basis for determining and allocating rental charges for non-Government use.

(2) For Plant Equipment with an acquisition cost of \$5,000 or more, the contractor's procedures are to:

- Establish a minimum level of use below which an analysis of need will be made and retention justified, except for inactive plants and equipment retained for mobilization. The level of use may be established for individual items or families of items, depending upon circumstances of use.

- Provide for recording authorized and actual use consistent with the established use levels.

- Require periodic analyses of production needs for Plant Equipment utilization, based upon known requirements.

- Provide for prompt reporting to the contracting officer of all plant equipment for which retention is not justified.

(3) There are no DFARS or AFARS policy supplements to FAR 45.509-2.

e. Defense Logistics Agency (DLA) Utilization Surveys.

(1) DLAM 8300.1, Production Manual for Contract Administration, provides guidance and procedures for conducting utilization surveys of Government-owned IPE and process-oriented OPE provided to contractors. Essentially, the surveys determine if contractors are meeting the requirements of FAR 45.509-2 (see paragraph d(2) above).

(2) A Defense Contract Management Command (DCMC) Property Administrator conducts an initial survey upon receipt of a new contract assignment and conducts follow-up surveys at least annually. During the initial survey, the Property Administrator insures that the contractor has procedures for controlling utilization of Government equipment. The manual states that the contractor's procedures should provide for the following (among other things):

- Establishment of Minimum Levels of Utilization (MLUs) for IPE that take into account contract and production requirements, production forecasts, special setups and operations, surge and mobilization requirements, open capacity on contractor and Government-owned IPE, and other factors. The DLA manual notes that for GOCOs, waivers of the MLU requirement should be the decision of the owning activity.

- A method for collecting, reporting, and evaluating utilization data.

- At least annual reviews to justify retention of equipment or to declare equipment excess when it falls below the established minimum level of utilization.

(3) DLAM 8300.1 recognizes that utilization control systems can vary considerably among contractors and industries and that a properly designed utilization control system will be compatible with other management information systems. The manual gives five examples of an acceptable IPE utilization system, any one of which or combination could be acceptable for a given set of conditions:

- Utilization Determined by Statistical Sampling.
- Actual Measurement by Meters, Timers, and Counters. This method is most applicable to IPE having a high dollar value (\$25,000) and will normally supplement other techniques.
- Manual or Mechanical Reporting in Conjunction with the Normal Manufacturing Production Control System(s). These are two of the more comprehensive methods for collecting and reporting utilization of machine tools. Data can be derived from and processed with the normal planning, scheduling, and reporting of manufacturing related to specific contracts/purchase orders.
- Group Identification. This method involves identifying as a unit either all of a particular type of equipment (engaged in similar operations) or all equipment engaged in one operation (items in a line may be of different types).
- Individual Item Identification. IPE may be of such a nature that usage is infrequent due to the fact that the equipment is acquired for specific specialized operation. In such a case, the facts should be documented and the retention justified based on the special nature of the operation.

(4) The DLAM states that utilization control of OPE, due to the nature of the property, will generally not be as detailed or sophisticated as the system for IPE. OPE systems basically require only sampling verification of the need or use and the quantity of items. Contractors are to keep minimum controls on OPE and should conduct reviews at least on annual intervals, depending upon the stability of workload and other pertinent and local conditions. They may use the technique of identifying/grouping low-cost Plant Equipment, support equipment, and other similar items to a manufacturing operation, production station, building, function, shop, working area, work station, tool crib, or a machine. In addition, contractors are to consider items of equipment where usage is usually infrequent due to the fact that it was acquired for a special purpose.

(5) The DLAM goes on to outline reporting requirements for the DLA Industrial Specialists when they complete initial or annual IPE/OPE and real property surveys. Included are: statements about the adequacy of IPE utilization records, machine loading data, and projections of future volume.

f. Reference Model for Computer Integrated Manufacturing (CIM).

(1) In order to help place equipment utilization management in the context of modern manufacturing practices, this section of the study summarizes portions of a 1989 text titled A Reference Model for Computer Integrated Manufacturing (CIM), published by the Instrument Society of America, Research Triangle Park, NC (see reference (1), Appendix 1). The text (page 195) defines CIM and provides some pertinent insights:

" . . . (CIM) is the use of computers to streamline flow of materials and information within a manufacturing organization. The goal of CIM is to increase productivity, product quality and manufacturing flexibility while decreasing cost and time-to-market. It's important to keep in mind that CIM itself isn't the goal, but instead a strategy to ensure the long-term survivability of the manufacturing organization.

"CIM is the strategy by which manufactures organize the various hardware and software components, such as robotics, machine vision, CAD, CAM and Manufacturing Resource Planning (MRP-II) into a unified system working toward the same goals. There is, however, no hard and fast scientific formula for CIM.

"Each organization must build its own CIM system to fit its personality and organizational requirements. CIM implies more than getting the various pieces of hardware in the manufacturing process communicating with each other. Organization and procedural flexibility is necessary in the CIM implementation process. Just as a CIM program is molded to the organization, the organization must be willing to change in order to realize the full benefit of a CIM implementation . . ."

(2) The text presents a CIM Reference Model, which is a representation of the data flow and functional tasks of a generic manufacturing organization. The uses of the CIM Reference Model include:

- Serving as a point of reference for discussions on CIM.
- Serving as a design guide for development of software and system architecture.
- Helping to define the path to new or improved production management systems by highlighting critical functions and providing a framework for requirements definition of the project.

(3) Figure 3 is a simplified version of the plant-level CIM Reference Model. The circles represent "Plant Functional Entities" of the generic manufacturing plant. They are specifically included in the CIM Reference Model and are further broken down to show subordinate functions/organizations and data flows (see Figures 4 and 5) within the generic plant. The rectangles represent "External Entities" to the plant and to the CIM Reference Model. The External Entities represent corporate staff and requirements influences on the factory.

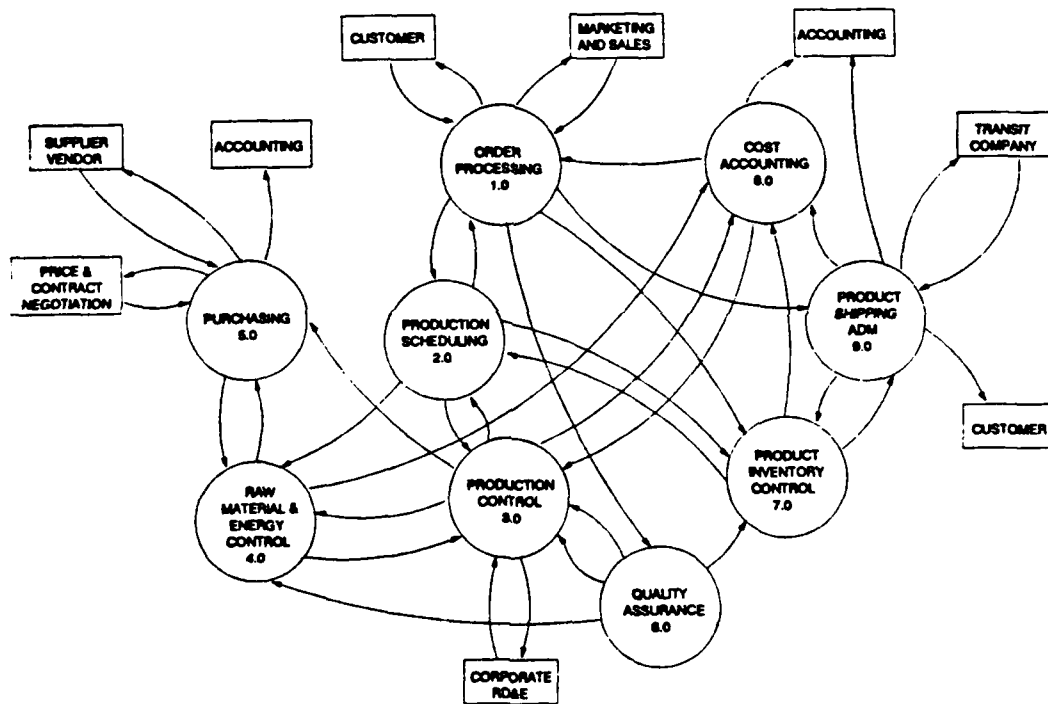


Figure 3. Information Flow and Functions of a Manufacturing Plant.

(Note. The Plant Entities (circles) in the CIM reference model are algorithmic in nature. The External Entities (rectangles) are innovative and algorithmic.)

(4) Figure 4 is shows greater detailing of the Production Control function/organization, entity 3.0, shown in Figure 3. Note that production plans, production performance data, and process information flow into or out of Operations Control, entity 3.3, on the figure.

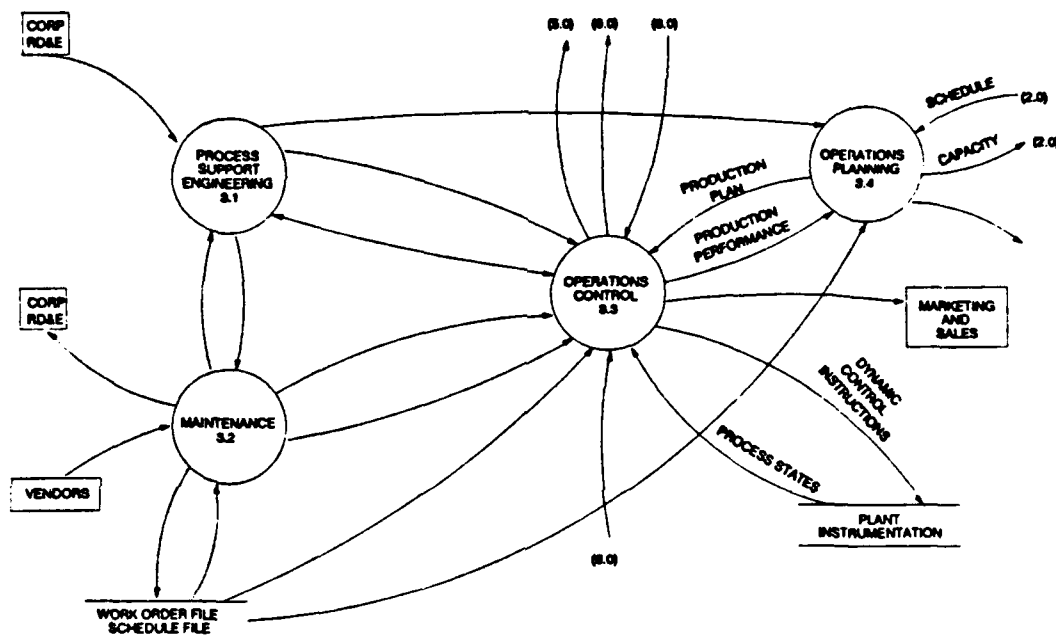


Figure 4. Production Control (3.0).

(5) Figure 5 shows greater detailing of Operations Control, entity 3.3, and it finally relates to Plant Equipment utilization management and data, at least by strong implication. Note the Equipment Monitoring (3.3.5) and Production Balancing and Optimization (3.3.6) functions/organizations and the utilization-type data flowing into or out of them.

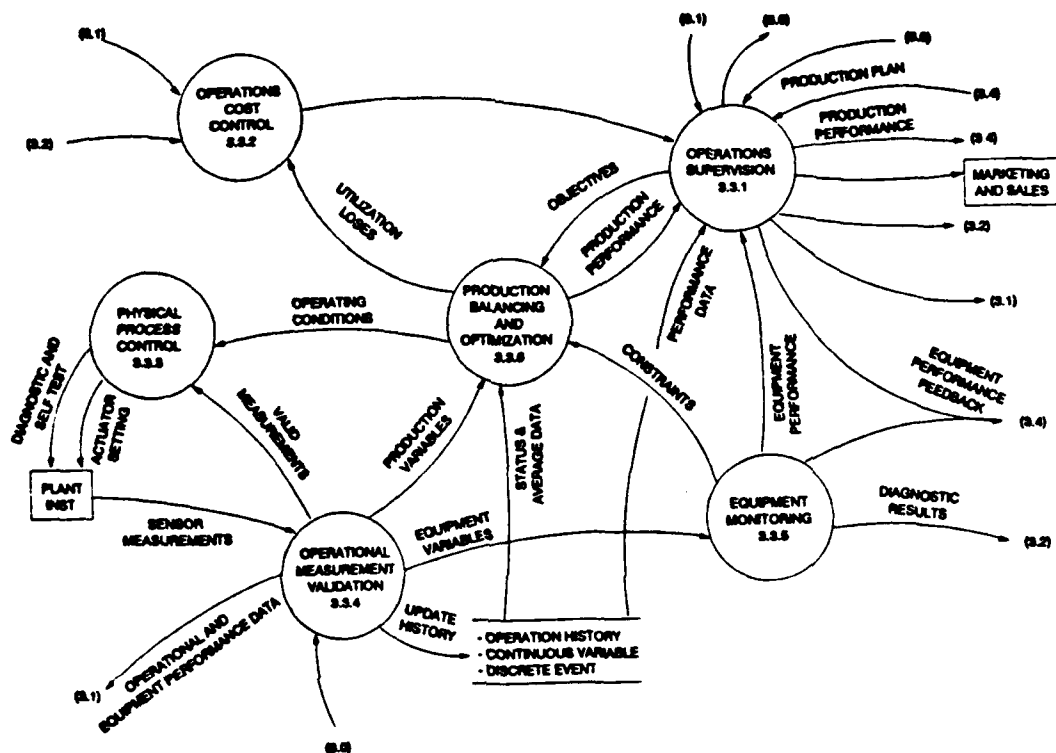


Figure 5. Operations Control (3.3).

(6) The text goes on to give abbreviated function statements for each of the organizations in the generic manufacturing plant. Functions that relate to Plant Equipment utilization management are summarized below:

- Production Control, 3.0.
 - Control transformation of raw materials into end products per production schedules and specifications.
 - Maintain Plant Equipment.
 - Do plant engineering and update process plans.
 - Issue raw material requirements.
 - Produce performance and cost reports (operating performance and cost reporting, rates, utilization, yield, quality, etc.) and send to cost accounting (8.0).

- Evaluate constraints to capacity and quality.
- Perform self-test and diagnostics of Plant Equipment and process controls.
- Process Support Engineering, 3.1.
 - Issue requests for modifications or maintenance.
 - Develop maintenance standards and methods.
 - Follow-up on Plant Equipment and process performance.
 - Follow-up on technological developments.
 - Develop specifications for purchase orders.
- Operations Control, 3.3.
 - Supervise operation of production process.
 - Track and report on production costs and performance (throughput, yield, rates, and quality).
 - Conduct diagnostics and self-check of Plant Equipment and process controls.
- Operational Measurement Validation, 3.3.4.
 - Assess validity of production measurement data.
 - Tag production measurement data with quality and time.
- Equipment Monitoring, 3.3.5.
 - Assess operating performance and limits of Plant Equipment.
 - Alarm equipment status variables (equipment performance, vibration, displacement, pressures, temperatures, and corrosion analysis) against constraints.
- Production Optimization and Balancing, 3.3.6.
 - Optimize production process to objectives (throughput, yield, rates, and quality) within equipment constraints.
 - Maintain material and energy balance to indicate exceptional conditions.

- Perform tests to determine production capacity.
- Monitor product quality against specifications and standards.
- Operations Planning, 3.4
 - Develop daily production plan (by production unit, equipment, and product) based on production schedule.
 - Determine percent of capacity status.
 - Modify production plan hourly to account for equipment, manpower, and raw materials problems.

(7) Appendix V of the CIM text presents an alternate model of the generic plant that is called the Japanese Model of the Enterprise, Figure 6. The authors found that it was not possible to completely relate its data flows and titles to the CIM Reference Model. However, the Japanese Model provides additional help in placing equipment utilization management within the context of modern manufacturing practices.

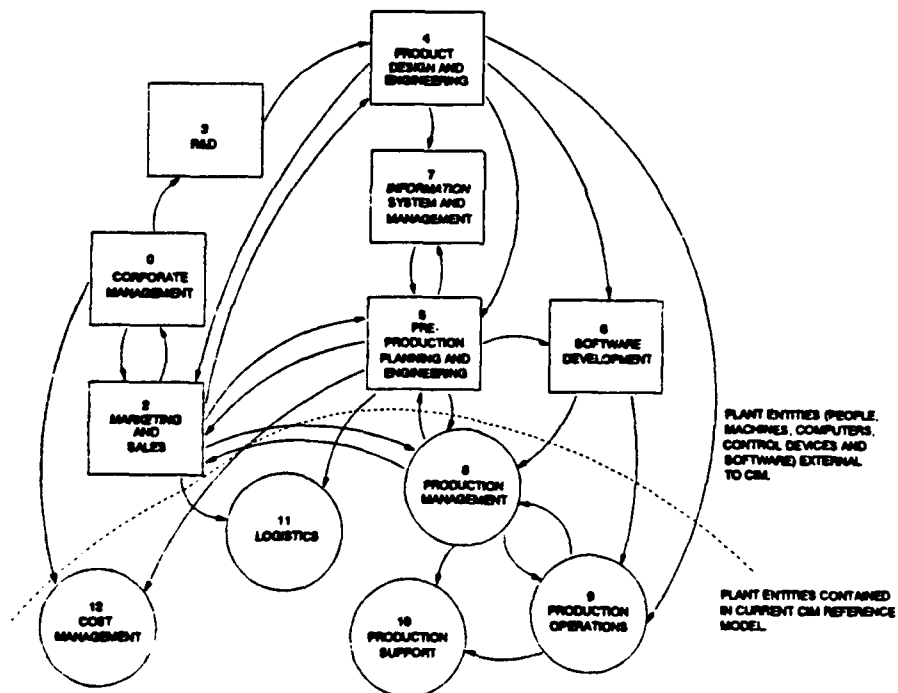


Figure 6. Japanese Model of the Enterprise.

(8) The CIM text defines the following tasks of the pertinent Japanese organizational entities:

- Corporate Governance and Management, 0.
 - Direction.
 - Strategic Planning.
 - Feasibility Studies (justification of capital investment, R&D management, and cost-benefit analyses).
 - Risk Management
- Corporate Staff Functions, 1 (not included in Figure 6, since corporate staff functions affect all other functions).
 - Purchasing (procurement contracts).
 - Personnel.
 - Transportation Services (shipping contracts).
 - Accounting.
- Production Management, 8.
 - Master Production Schedule.
 - Production and Inventory Control.
 - Program Storage and Distribution.
 - Production Monitoring.
 - Maintenance.
- Production Support, 10.
 - Procurement.
 - General Stores.
 - Maintenance (scheduled and corrective).
 - Plant Security (fire and watch).
 - Energy Management.

- Time and Attendance.
- Environmental Control.
- Health and Safety.
- Waste Material Management.
- Logistics, 11.
 - Receiving.
 - Warehousing and shipping.

g. The Toyota Production System.

(1) The intent of this section of this study--as with the CIM section, paragraph f above--is to summarize and explain the place of equipment utilization management in modern production management.

(2) In a 1983 soft cover book titled Toyota Production System, Yasuhiro Monden writes that the Toyota production system is a gigantic advance in production methods and that another such advance will not likely occur for some time to come. Assuming that this is true (and it very likely is), the author explains in detail many modern and practical production techniques that would be used in a CIM environment. Specifically, Toyota established or emphasized the following:

- The "Kanban" system to maintain just-in-time production.
- Production rate smoothing concepts for producing variations of a product.
- Methods to drastically shorten machine setup time.
- Standardization and efficiency regarding work methods.
- Machine layouts, a multi-functional work force, and job rotation to realize flexible workshops.
- Improvement activities by small groups and a suggestion system to reduce the workforce and increase worker morale.
- Mechanisms to detect abnormalities or defects and mechanisms to stop machines or production lines when abnormalities or defects occur.
- A "Functional Management" system to promote company-wide quality control and cost management.

(3) Under a Kanban system (same as a just-in-time or pull production planning and scheduling system), subsequent manufacturing processes go to the preceding processes to withdraw the necessary parts at the necessary times. The book states that if subsequent processes withdraw parts in a fluctuating manner in regard to quantity or time, then the preceding processes should arrange for as much inventory, equipment, and manpower to adapt to the peak demand.

(4) The author writes that in 1970, Toyota succeeded in shortening the setup time of an 800-ton punch press for a hood and fender to three minutes. He states that American and European companies often spend from two to several hours, or at worst, an entire day on a setup action. Toyota recognized that by shortening setup time, they could minimize lot size and, therefore, the stock of finished and intermediate products. Through small lot production, production lead time for different products can be reduced, and the company can adapt very quickly to customer orders and changes in demand. He adds that reduced setup time has the potential of increasing equipment utilization, but he notes, however, "that the machinery utilization rate is allowed to be low since overproduction is considered to lead to waste, a worse situation than a low utilization rate. The minimization of stocks, job-order oriented production, and prompt adaptability to demand changes are the most important advantages."

(5) Similarly, Toyota's new ideas about machine layout may reduce the importance of high equipment utilization. Conventional methods engineering theory holds that a worker should never walk at all while working at a certain position. The author states that the idea is correct from the standpoint of the productivity of an individual worker. However, it is incorrect when viewed from the standpoint of line balancing within a whole factory and of minimizing the total number of workers. In addition, if workers are separated and workpieces are moved from one worker to another (i.e. on a conveyor), the workers cannot help each other. Toyota rejected ideas about "isolated island layouts" and "linear layouts" in favor of combining several U-form machining lines into one integrated line, see Figure 7 below. Such a line allows reallocation of operations among the workers in response to variations in production quantities of automobiles.

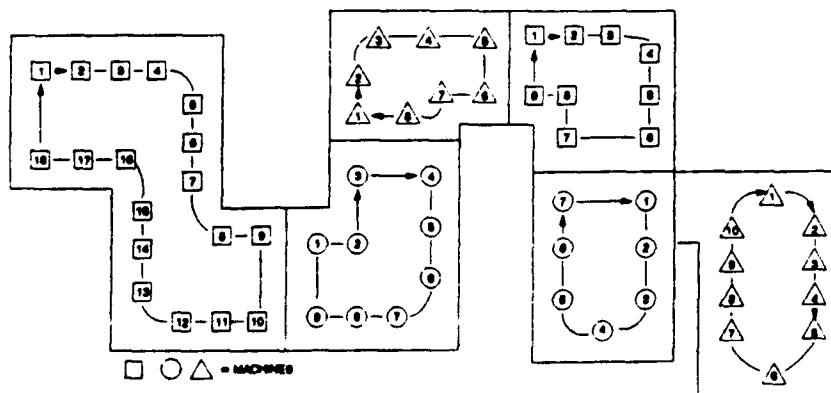


Figure 7. Combining U-Form Lines (6 parts, A through F).

(6) Figure 8 shows an example of how the combined U-form line (making six different gears for a gear box) would be staffed if the demand for gear boxes in one month (January) required a cycle time of one minute. Under this cycle time, eight workers would be required, and the walking route of each worker is described by the arrowed lines.

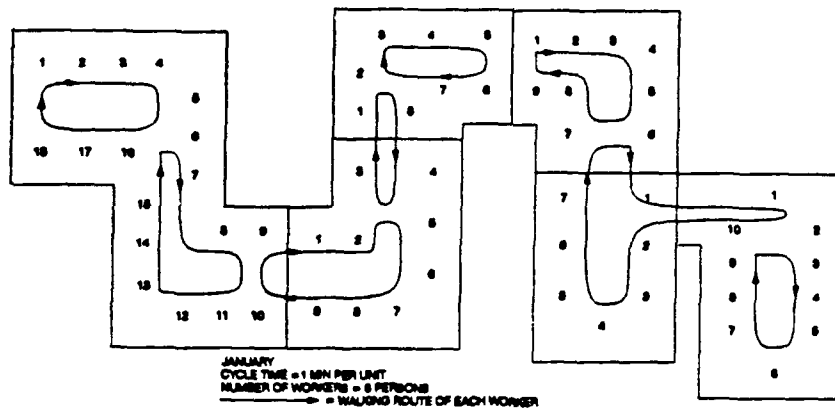


Figure 8. Allocation of Work in January.

(7) If, in February, the monthly demand decreased and the required cycle time was increased to 1.2 minutes per gear box set, the walking routes could readily be expanded as shown in Figure 9, thus eliminating the seventh and eighth workers.

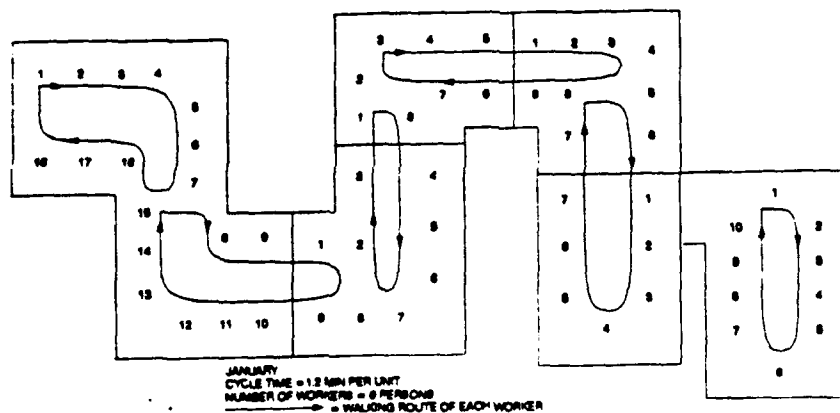


Figure 9. Allocation of Work in February.

(8) The information system that supports Toyota's production system includes Actual Performance Collection and Actual Performance Transition subsystems. The Actual Performance Collection subsystem collects performance data on a daily basis for each manufacturing process (machine) and compiles the data for the month. The performance data includes production quantity, processing time, setup time, cycle time, and machine idle time. Monthly production data is compared to the monthly plan. If there are unfavorable variances, remedial action is taken. Actual performance data is also fed back as basic data for use in planning the next monthly period. The Actual Performance Transition subsystem transforms actual performance data into time-series data for the latest three months. This highlights technical differences between processes and between capacity-utilization rates for individual process. Toyota ultimately uses the time-series data to promote company-wide improvements in engineering techniques.

h. Manufacturing Resource Planning.

(1) A basic review of Manufacturing Resource Planning (MRP II) concepts also provides important insights for development of new equipment utilization management policies. This section of the study relies on the Production and Inventory Control Handbook, McGraw-Hill, Inc., 1987, as the source document for MRP II information.

(2) Chapter 4 of the handbook explains that up until the late 1960's, there was a distinct separation between those who ordered materials in a factory and those who expedited orders. A number of companies then began using computers in a different approach to the ordering of materials. Instead of using inventory reorder points, they started exploding requirements down through bills of materials. The term Material-Requirements Planning (MRP) was used to describe the process. The handbook explains that:

"Not only does MRP order material at the right time, but also it has the distinct advantage of being the only system available for rescheduling. For each schedule, MRP checks the current due date of material against the current need date. The due date is the expected completion date. The need date is when there will be a shortage or the safety stock will be used unless existing scheduled materials arrive. Whenever there is a difference between these two dates, MRP generates an action message to alert the user to review the situation."

(3) Figure 10 below is an example that the handbook uses to illustrate a MRP system. A is the end product, 1 is a component of A, and 2 is a component of 1.

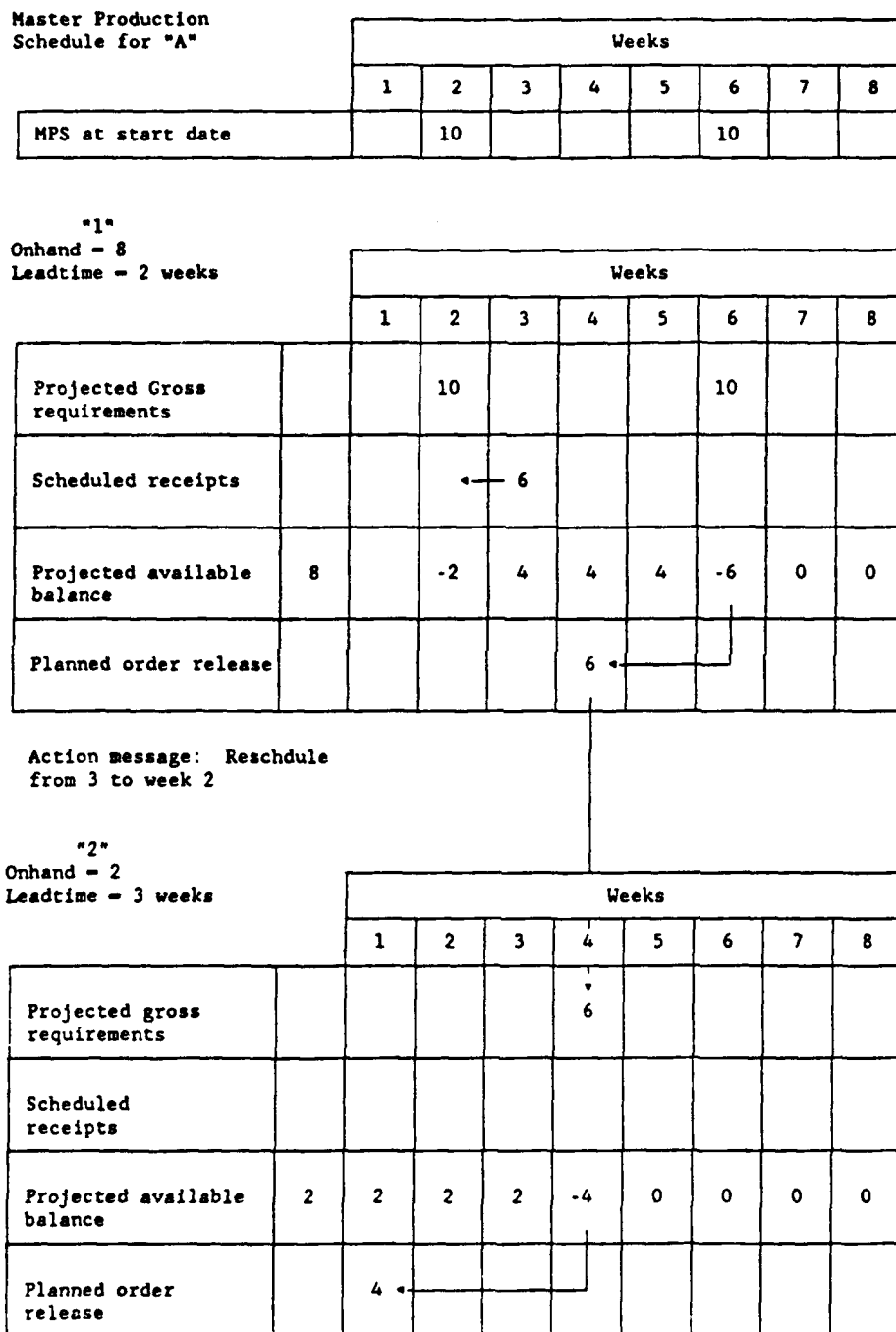


Figure 10. MRP Example.

(4) The handbook explains that the term Manufacturing Resource Planning, represented by the acronym MRP II, was first used in 1979 to describe how several companies integrated their operating and financial systems. Current MRP II systems have three core functions: Master Production Scheduling (MPS), Material Requirements Planning (MRP), and Capacity Requirements Planning (CRP).

- MPS is item-by-item scheduling of finished products. The master schedule shows what a plant is to produce in terms of of specific configurations of products (e.g. colors and styles). It specifies required dates and exact quantities, and it is usually done on weekly basis. MPS items call out bills of materials that are processed in MRP.
- MRP, as described in paragraph (2) and (3) above, determines component requirements by exploding the MPS items against their bills of materials to create associated demands. The process continues down to the lowest level of the bill structure and results in time-phased inventory requirements.
- CRP uses current and projected work orders (from MRP demands) and standard times from routings to determine load profiles over time for work centers. The load profiles are compared against available capacity to analyze the shop's ability to perform. Adjustments are then made if necessary. The handbook gives an example of CRP outputs for a particular machine as shown in Figures 11 and 12 below:

Demonstrated Capacity: 500 Standard hr/wk.

Week	Hours	0%	100%	200%
Past due	150	XXX		
9/15	550	XXXXXXXXXXXXX		
9/22	600	XXXXXXXXXXXXX		
9/29	500	XXXXXXXXXXXXX		
10/6	400	XXXXXXXXXXXXX		
10/13	550	XXXXXXXXXXXXX		
10/20	250	XXXXXX		
10/27	150	XXX		
11/4	850	XXXXXXXXXXXXXXXXXXXXX		

X - released order load; X - planned order load.

Figure 11. Example of a CRP Output.

Workcenter BHJ, Department 038

Week	Hours	Part Number	Order Number	Type
10/27	21.3	7-1007	101	REL
10/27	36.9	8-8162	123	REL
10/27	19.2	7-2152	118	REL
10/27	14.6	6-3894	134	REL
10/27	26.8	4-9833	115	REL
10/27	<u>31.2</u>	2-1102	999	PLN
	150.0			

REL - released order; PLN - Planned order.

Figure 12. Example of a CRP Detail Display.

(5) Extensions to MRP II include ties to customers to share information, maintenance planning, design engineering and drafting, and simulations (drop-in analysis).

(6) The handbook summarizes by saying that MRP II:

" . . . is a formal system within which top management can communicate business objectives to the entire organization. Top management develops business, sales, and production plans and communicates these to the operating management. These plans are used to create the MPS by using the bill of materials, routings, work centers, and inventory data to plan material and capacity requirements.

"The material requirements are then communicated to purchasing and the shop floor. The capacity requirements are reviewed so that sufficient capacity is available in each work center.

"Feedback is given to top management in terms of performance measurements so that actual versus planned performance can be made by top management. . .

"Accurate, complete, and standardized documentation of all product and process information is essential for the successful use of MRP II."

(6) Of the three core parts of MRP II, CRP most closely relates to equipment utilization, or rather, projections of equipment utilization. In addition to CRP, manufacturers frequently use a less detailed planning tool called Rough-Cut Capacity Planning (RCCP).

"The RCCP analysis is typically performed much less frequently and covers a longer time span than the weekly shop load reports produced by capacity resource planning (CRP) systems . . . The

RCCP analyses also involve the use of simpler capacity planning techniques and far less detailed information than the CRP analysis. That is, RCCP typically involves the use of bills of capacity or simple planning factor estimates instead of time-phased MRP and routing file data. The simpler procedures, though less accurate, permit a quick analysis to indicate whether the MPS is feasible in view of the current capacity of the company. They also permit a rapid analysis of several alternatives that may be posed by top management in reviewing the MPS. Such an analysis sometimes leads to a decision to change the MPS to accommodate the capacity limitations of key facilities or to maintain the MPS and implement adjustments to capacity involving overtime, subcontracting, alternate routing of work, employment level changes, and so forth. These changes are often planned over considerable time, covering a quarter or more in the future."

(7) It should be noted that commercially available MRP II software packages may have options that support Just-In-Time (JIT) production control of repetitive manufacturing. JIT control, a generic name for the Toyota Production System as covered in paragraph g above, has the objective of reducing inventories and manufacturing lead times to the lowest possible levels. The handbook states that JIT is sometimes referred to as the Kanban system, a pull system of production control as opposed to a push/strictly-MRP system. In a pull system, work centers (machines) take their cues (e.g., Kanban cards) from the users of the parts rather than a central planning office. Parts made sit at the location where they are made. Under a push system, they are moved to the users soon as possible after they are made. The handbook cautions that there is much more to a JIT manufacturing system than just pull production control, and it lists the following techniques, principles, and systems required to make it work:

- | | |
|------------------------------|--------------------------|
| • Good housekeeping | • High quality |
| • Skill diversification | • Setup time reduction |
| • Focused worker involvement | • Lot-size reduction |
| • Control by visibility | • Balanced flow |
| • Supplier networks | • Preventive maintenance |
| • Pull systems | • Cellular manufacturing |
| • Uniform plant load | • Compact plant layout |

(8) The handbook also names and describes different types of manufacturing systems that may be used to characterize Army-owned plants, depots, and installation machine shops:

• **Project Systems.** Such a system produces a single item or a group of items at one location within a limited time period. Examples are battleships, buildings, and dams. Once the product or service is provided, the means of production is moved to a new location.

• **Job Shop Systems.** The system produces low-volume items that require constant design changes to meet consumer demand. In a true job shop, each job is processed differently. Shop buildings are usually small, and equipment is functionally configured. Equipment, materials, and tooling are general purpose. Highly skilled labor performs complicated tasks. The advantage of the system is flexibility at the expense of volume. There is minimum utilization of fixed assets, but fixed costs are relatively low while variable costs are high. Products are made or engineered to order. Product examples are tooling, special purpose machinery, and custom clothing.

• **Intermittent Production Systems (also called intermittent job lot).** The system repeats many different jobs relatively frequently. Lot quantities may vary from a few to many thousands of items and move in discrete units. Work in process is usually large. Most equipment is functionally configured by department, although some equipment may be in lines. The equipment tends to be less general purpose and more functionally specific, especially the automated equipment. Less skilled labor may be used for repetitive tasks and some sophisticated tooling may be used to increase productivity. Fixed operating costs may be higher than job-shop production, because of a higher investments in equipment and tooling. Variable costs may be lower, because of the less skilled workers. Products are typically stocked or are finished to order. Product examples are home appliances, office equipment, hand tools, and electrical machinery.

• **Repetitive Production Systems (also called intermittent flow and assembly line).** The system runs steady jobs for a time, and there is little, if any, distinction between lots. Most equipment is configured linearly, with the exception of a few feeder departments, and it tends to be very special purpose and product specific. Special Tooling is used extensively. Products are moved between operations in very small batches approaching continuous flow. Work in process is low. Labor can be much less skilled, because the equipment and tooling provide the technical results. High levels of production and equipment utilization generate substantial profits, since fixed costs tend to be high and variable costs low. On the other hand, low levels of utilization mean large losses. Products are usually made for stock and few are finished to order. Product examples include automobiles, home computers, and television sets.

• **Process Production Systems (also called continuous flow and flow process).** The system produces different products by almost identical methods. All equipment is configured linearly, with the possible exception of material preparation (blending, mixing, and, weighing) and packaging. Material flows at specified rates from raw material to finished product. Routings are the same for products made on specific lines, but clean out of equipment between runs of different materials represents significant work. Work in process is low. As with repetitive production systems, variable costs are low due to the

use of less skilled labor and extensive engineering efforts to reduce material costs. Fixed costs are high due to the use of special and extensive facilities. Products are typically bulk commodities that may be packaged to order. Examples include chemicals, paint, and food.

1. Direct Contacts.

(1) Ken Oehler, General Engineer at IEA, reported on machine shop equipment reporting at AMC's Materials Technology Laboratory (MTL), Watertown, MA. MTL is exempt from the equipment usage reporting procedures of AR 71-13 and AMCR 700-64, because it is a RDTE facility. However, MTL keeps track of equipment usage on their IEMS computer, based on AMC Form 2813 cards (see Figure 1) filled out by machinists. Utilization reports on specific machines flow through MTL's logistics side, including the equipment manager, to the commander if there is little use on the machines. The commander then passes the reports down to the engineer and scientist side of MTL for justification to retain. The engineers and scientists have the final say on unique equipment need for future projects. The machine shop equipment does not have hour meters.

(2) Ron Machetta, who is in charge of plant engineering and maintenance at Alcoa's Davenport Works, said that the Davenport Works has a machine shop that supports maintenance of production machines. The plant has a policy that they try to do as much machine shop and maintenance work as they can in house. They buy equipment for the machine shop to do the maintenance jobs that they may need to perform, although there has been very few equipment additions over the years. They do not generally have hour meters or keep track of utilization on machine shop equipment, but they do on their production machines. Since they have a very high investment in the most modern production equipment, the Davenport Works is going beyond preventive maintenance to predictive maintenance. Predictive maintenance includes oil, vibration, and other types of analysis. They do mostly preventive maintenance on their machine shop equipment, however.

(3) Walt Roll, General Engineer at IEA, retired from Deere & Co. after 28 years as an engineer in the areas of research and development and manufacturing. He confirmed the benefits of such modern manufacturing management techniques such as MRP II, Just-In-Time production systems, and manufacturing cells. He added that Deere & Co. sold the Rock Island Arsenal a Group Technology program that provides information for determining optimum manufacturing cell configurations based upon the type of parts to be produced and the production machines available. The parts are coded in great detail to describe shape and required manufacturing operations while machine tools are similarly coded by capability. He said that in the past, machine utilization was a major factor in the justification of new machine tools at Deere & Co. With the advent of cellular manufacturing, justification is based on the overall economic comparison of manufacturing alternatives, rather than individual machine utilization.

(4) Gerry Moeller, General Engineer at IEA, said that there are many MRP II systems commercially available. He provided brochures on two such systems:

- XL MAC-PAC for the IBM AS/400 by XL/Datacomp, Inc. and Anderson Consulting. They offer software for master scheduling, market forecasting, MRP, JIT-repetitive manufacturing, purchasing, accounts payable, general ledger, shop floor control, capacity planning, product costing, fixed assets, payroll, and general ledger among many other applications.

- Advanced Planning System (APS) by CARP Systems International. This is a \$200,000 to \$500,000, high-end system that adds on to existing MRP II systems. The APS requires the use of top-end workstations having a high processing speed of 70 MIPS or better coupled with 150 Mbytes of core processing storage. This combination of speed and core storage enables embedding a third party's MRP system within the APS software shell to perform very rapid "what if" computations. The rapid turn around capability enables fine tuning inputs to the embedded MRP system, often resulting in paying for the APS system with just one application. The APS is costly because it generally requires a considerable amount of coding to embed the users MRP system into the APS system.

Mr. Moeller noted that his division has a new Sun computer that has the potential to run MRP II software.

5. CONCLUSIONS.

- a. The Army Equipment Usage Management Program as presented in Chapter 4 of AR 71-13 does not reflect modern business and engineering practices, and it contains contradictions within itself.

- b. The equipment usage standards contained in Appendix G of AR 71-13 are not supportable in a modern production control environment.

- c. The FAR and DLAM 8300-1 better recognize and are more compatible with advancements in modern production control techniques than AR 71-13. In addition, by requiring that contractors prepare acceptable procedures for controlling equipment utilization, the FAR and the DLAM are written more from a corporate-level view point than from the AR's detailed and functional one.

- d. Army equipment usage management policy should permit installations to develop their own equipment usage standards that depend upon individual circumstances.

- e. The AMC arsenals, depots, and plants may need to make changes to their organizational structures to fully implement CIM and realize its benefits: increased manufacturing productivity, quality, and flexibility.

f. Equipment utilization data is a recognized necessity for production control.

g. An ideal approach to authorizing Installation Equipment involves looking into the future instead of emphasizing past history. The Capacity Resource Planning (CRP) element of Manufacturing Resource Planning (MRP II) provides the necessary tools.

6. RECOMMENDATIONS.

a. Chapter 4 of AR 71-13 should be revised and shown in Appendix 2 to reflect modern business and engineering practices.

b. I&SA, as a HQ AMC level organization, should emphasize corporate-level functions. Examples include:

(1) Insuring the AMC installations and plants have adequate written procedures to control equipment utilization.

(2) Insuring that the installations and plants are actually following their written equipment utilization procedures.

(3) Providing management and technical support to the installations and plants to include standard/commercial automated systems (e.g. off-the-shelf MRP or MRP II systems that are compatible with IEMS and small job shop operations).

(4) Insuring that TDA manufacturing and depot maintenance activities are organized in accordance with modern manufacturing principles.

c. The I&SA should avoid becoming involved plant engineering functions at AMC installations and plants (e.g., individual equipment retention decisions).

APPENDIX 1

REFERENCES

REFERENCES

a. Williams, T. J., Editor, A Reference Model for Computer Integrated Manufacturing (CIM), Instrument Society of America, Research Triangle Park, NC (1989). This is known as the International Purdue Workshop (IPW) Model.

b. Monden, Yasuhiro, Toyota Production System, Industrial Engineering and Management Press, Norcross, GA (1983).

c. Greene, James H., Editor in Chief, Production and Inventory Control Handbook, McGraw-Hill, Inc., New York, NY (1987).

APPENDIX 2

AR 71-13 CHANGES

equipped with a winch as required and justified.

f. Vehicles in category I TOE or MTOE units may be equipped with a winch, not to exceed one winch for each eight vehicles, except that—

(1) Limitations indicated in a through e above will apply to the vehicles listed.

(2) Company and similar size units will be authorized a minimum of one winch.

g. Vehicles in category II and III TOE or MTOE, except for vehicles identified in c through e above, will not be equipped with winches.

h. Vehicles in TDAs may be equipped with winches subject to the limitations indicated in a through e and g above; however, vehicle justification must include additional data to support the winch requirement.

Section V Office-type Furniture and Equipment

3-62. General

The publications listed paragraphs 3-63 and 3-64 are the only DA authorization documents for office-type furniture and equipment except as otherwise stated.

3-63. AR 1-39

This AR is applicable to all Army activities in the NCR. (See para 2-77.)

3-64. CTA 50-909

See CTA 50-909, chapter 1 for specific instructions. CTA 50-909, chapter 14 is applicable to Army offices outside the NCR and those within that are not serviced by DSS-W. It provides the BOI and authorizes these items for requisition or procurement without additional documentation or other action required except as discussed below.

a. Calculators and accounting machines.

(1) Nonprogrammable and certain programmable calculators and accounting machines costing less than \$5,000 are authorized by CTA 50-909, chapter 14.

(2) Other programmable calculators and accounting machines will be included in the appropriate TAADs document after the items have been approved per the AR 25-series and AR 310-49. This includes equipment that possess the following inherent automated data processing (ADP) capability characteristics:

(a) Input and output can be automatically processed on ADPE devices such as tabulating card readers, magnetic tape readers, cathode ray tubes, plotters, or printers.

(b) Operation of the device can be through common user-type software such as COBOL, BASIC, or FORTRAN programming languages.

(c) Mass storage devices can be used for processing or software residency.

(d) The equipment is capable of operating in a general purpose mode.

b. Copying equipment. Copying equipment costing less than \$5,000 is authorized in chapter 14 of CTA 50-909 after the requester has complied with the provisions of AR 340-20. Copying equipment costing

\$5,000 and over will be included in the appropriate TDA per AR 340-20 and AR 310-49.

c. Files equipment. Electronically-powered filing equipment and automated filing systems are HQDA-controlled regardless of cost. Standard filing equipment costing less than \$5,000 or nonstandard filing equipment, except electronically powered filing equipment and automated filing systems, costing less than \$5,000 is authorized by CTA 50-909. Standard filing equipment costing \$5,000 and over, nonstandard filing equipment costing \$5,000 and over, electronically powered filing equipment, and automated filing systems will be included in the appropriate TDA per AR 340-4 and AR 310-49.

d. Micrographics equipment. CTA 50-909, chapter 14, authorizes microform viewers and viewer-printers costing less than \$5,000 after the requester has complied with the provisions of AR 340-22. All other micrographics-related equipment will be included in the appropriate TDA after approval per AR 340-22 and AR 310-49.

e. Word processing equipment. The type of equipment formerly referred to as word processing equipment is now considered Information Management Area (IMA) equipment. This equipment costing less than \$5,000 is being authorized in CTA 50-909. This equipment costing \$5,000 and over will be included in TAADs documents per AR 25-5 and para 2-64.

f. Contemporary (steel) office furniture. Except as specifically authorized in CTA 50-909, chapter 14, GSA contemporary office furniture is not authorized for use in the Army except activities in the NCR serviced by DSS-W.

3-65. Systems furniture

Systems furniture is defined as an arrangement of modular panel supported components, using vertical space, that meets prescribed functional work station requirements. The components consist of work surfaces, storage units, power and communications outlets, and privacy panels that interconnect and are assembled into work stations of various sizes, configurations, and complexity.

a. MACOMs will authorize and approve acquisition of systems furniture. This authority cannot be redelegated to a lower organizational level.

b. Furniture in FSC group 71, part III, section E of the FSS is considered systems furniture for the purpose of this paragraph.

c. The forms and analysis formats contained in General Services Bulletin FPMR E-210, subject: Acquisition of Systems Furniture, will be used with the request for systems furniture. The guidance in Federal Property Management Regulation D-71, 14 May 86, subject: Work Space Management Reform, will also be used.

d. MACOM review and approval will precede procurement by the requesting activity. Prior to approval, the MACOM space facility management office will review

the cost comparison analysis, program management data, the proposed design or layout, and any other information submitted as justification for the acquisition of systems furniture.

e. Since systems furniture is more expensive than conventional furniture, the approving authority will also determine if available conventional furniture was considered by the requesting activity and if this furniture would be appropriate for the requirement.

f. Requests for ADP-type furniture identified as high tech in GSA catalogs will be considered conventional furniture for ordering purposes.

Chapter 4 Equipment Usage Management

4-1. General

In the area of equipment usage management, the Army's objective is to obtain optimum use and efficient management of equipment used by TDA activities to meet mission requirements with the minimum of equipment. ~~Usage standards with management programs for some types of equipment are already established and published. (See para 4-3 for exemptions.)~~ The purpose of this chapter, ~~therefore~~, is to prescribe an overall Army Equipment Usage Management Program, ~~and to prescribe usage standards for types of equipment not managed by other Army or DOD publications.~~

4-2. Applicability

a. This chapter applies to all Active Army TDA activities or installations.

b. This chapter does not apply to TDA activities or installations in combat areas or to the ARNG or the USAR.

4-3. Exemptions

The following categories of equipment are exempt from the provision of this chapter:

a. Information management area (IMA) equipment. Usage of IMA equipment will be managed per the AR 25-series.

b. Aircraft. Usage of aircraft will be managed per chapter 3, section II.

c. Army rail equipment. Usage of Army rail equipment and locomotives will be managed per AR 56-3.

d. Government-furnished equipment. Usage of GFE by contractor activities will be governed by the FAR, the DFARS, and the AFARS. Contracts will include the requirements of this regulation for all GFE. The performance work statement (PWS) must be specified in all areas where equipment is located, to ensure the utilization data is collected and reported as required.

e. Medical equipment. Usage of medical equipment will be managed per AR 40-61.

f. Investigative and laboratory equipment managed by the U.S. Army Criminal Investigation Command. This equipment is exempt from usage collection and reporting. It is

prepositioned to await use in special situations. Therefore, even if the situations do not occur, the requirement is still valid.

g. Defense Industrial Plant Equipment Center-controlled equipment. DIPEC-controlled equipment is exempt from usage collection and reporting. Walk-through procedures (para 4-6) will be used to evaluate the need for the equipment. Duplication of equipment with like capabilities will be held to the minimum necessary for mission requirements. This equipment will be reviewed for retention during scheduled reviews and inspections by higher headquarters.

h. Equipment used in direct support of a research, development, test, and evaluation mission. Equipment required in direct support of a RDTE mission is exempt from usage collection and reporting. Walk-through procedures, para 4-6, will be used to evaluate the need for the equipment. Duplication of equipment with like capabilities will be held to the minimum necessary for mission requirements. This equipment will be reviewed for retention during scheduled reviews and inspections by higher headquarters.

i. Plant equipment package (PEP) or mobilization lay-away equipment. Equipment in an inactive PEP or mobilization lay-away does not require utilization data collection as long as the equipment remains in a true, approved, inactive PEP or mobilization lay-away package. If removed from PEP or lay-away status and used, then utilization data collection is required.

j. One-of-a-kind equipment. The requirement for utilization data collection for one-of-a-kind equipment, is not required. One-of-a-kind is defined as being that one and only specific type of equipment located on an installation. This does not mean one-of-a-kind in an organizational element of the installation. Retention for such equipment will be documented and justified. This area will be monitored during DA, MACOM, or MSC inspections or reviews of installation logistics or equipment management, such as AKA or IG.

k. Common Tables of Allowances (CTA) equipment. Collecting of utilization data for CTA type items is not required. This eliminates the requirement to collect utilization data for low dollar valued items.

l. Installed equipment. Utilization data collection for installed equipment such as generators and compressors, which are a part of a real property facility, is not required. Installed equipment is defined in para 2-79.

m. Emergency equipment. Equipment required to be maintained on hand for emergencies, such as generators, compressors, wreckers, ambulances, fire trucks, etc., does not require utilization data collection. Retention for such equipment will be based on documented justification. This area will be monitored through inspections and reviews by higher commands, as stated in para 4-24.

4-4. Policies

a. Minimum quantities of equipment will be acquired and retained to perform the assigned mission in the most cost effective manner.

b. Equipment not justified for retention will be promptly reported for redistribution or excess disposition in accordance with applicable regulations, and the TDA will be adjusted at the earliest practical time.

c. Maximum practical use of current installation or activity equipment resources will be achieved, to include use of equipment and personnel resources of tenant TOE units to accomplish or share functionally-related workloads whenever feasible.

d. To the extent practical, similar age equipment with established economic life expectancies (mileage, age, hours of operation) will be rotated to equalize mileage or usage during the established life expectancy of the equipment.

e. CONUS installation or activity equipment will be pooled to the maximum practical extent to assure optimum usage. Pooling within military communities overseas is also appropriate to the objectives of this chapter.

f. Maximum practical use will be made of rental, lease, and loan of equipment in lieu of ownership when operationally acceptable and economically feasible.

g. Government-owned installation or activity equipment will be placed in administrative storage when usage standards are not met and future requirements for the equipment are uncertain. Installation or activity equipment, except seasonal equipment, will not be held in administrative storage longer than 90 days without approval from the MACOM, unless disposition instructions for excess equipment have been requested and receipt thereof is impending. Final disposition should not be made without coordination with the last using activity.

h. General purpose, passenger transport, and special purpose vehicles. Additional guidance for vehicle management can be found in DoD 4500.36-R, AR 58-1, AR 420-83, AR 700-88, DA Pam 738-750, TM 38-600, and TM 38-750-1.

i. Support equipment, as identified in appendix G, which is portable with multi-user capabilities and acquisition cost of less than \$2,000, will not require utilization data collection.

j. Motorized materials handling equipment, which have meters, will have utilization recorded using DD Form 1970, Motorized Equipment Utilization Record, or AMC Form 2205, IEMS Mobile Equipment Utilization Record. Realistic utilization criteria for this category of equipment will be established by each installation/activity commander based on mission requirements.

k. Industrial plant equipment (IPE), identified in AR 700-43 as status 1A, should have metering devices installed on them, with daily meter readings being taken and recorded. IPE is that part of plant equipment with an acquisition cost of

\$5,000 or more; used for the purpose of cutting, abrading, grinding, shaping, forming, joining, testing, measuring, heating, treating, or otherwise altering the physical, electrical, or chemical properties of materials, components, or end items entailed in manufacturing, maintenance, supply processing, assembly or research and development operations.

l. Seasonal equipment will have utilization data collected and recorded when used. Examples of seasonal equipment are agriculture tractor, snow removal equipment, etc. This equipment will be monitored by inspection and review, as stated in paragraph 4-25. The requirement to submit justification for retention of this equipment underutilized for four consecutive quarters is eliminated.

m. Since requirements for all categories of equipment in appendix G, with exception of watercraft, have gone to operational days for utilization collection, a single format, automated or manual, for documentation of utilization data is authorized for all categories of equipment.

n. All equipment in appendix G which meets the requirement for utilization data collection, regardless of where the equipment is utilized, such as RDTE and TMDE, or funds used to procure the equipment, such as AIF and production support, will have utilization data collected and reporting requirements met.

4-5. Procedures when usage standards are established

a. Daily usage and availability data will be recorded on DD Form 1970 (Motor Equipment Utilization Record) per DA Pam 738-750 or on other forms in accordance with instructions in the MACOM supplement to this regulation for the equipment categories shown in paragraph G-5. Equipment usage data compiled by mechanical means per authorized systems such as the AMC Installation Equipment Management Systems may be used in lieu of DD Form 1970 where records developed fulfill the requirements of this regulation. Usage of Army equipment listed and so indicated in DA Pam 738-750, appendix E will be recorded on DA Form 2408-9 (Equipment Control Record).

b. Consolidated monthly usage and availability data totals will be recorded on a locally-produced report. The report will normally be prepared on plain bond paper and will include the following categories: Date; nomenclature; registration or serial number; life expectancy; usage basis (to include minimum standard and objective standard); number of miles and hours used; days operated; and so forth (to include computed use percentage and rating); locally-derived formulas (other than in para G-4a); and signature of the preparer. The usage basis can be miles, hours, operational days, or some other basis. The minimum and objective use percentage standards are listed in paragraph G-5.

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new Ag. based
on old Ag.

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new Ag 4-5

(1) Each month, the actual usage will be recorded and the used percentage will be computed using the appropriate formulas from paragraph G-4c or a locally devised formula when days, hours, and miles are not the basis for usage.

(2) The percentage used will be compared with the monthly criteria and one of the following ratings will be assigned:

(a) U—used less than minimum criteria.

(b) M—used than minimum but less than objective criteria.

(c) O—objective criteria achieved or exceeded.

c. At the end of each calendar quarter, a consolidated quarterly usage and availability data report will be prepared in the same manner as b above. The procedures indicated in b(1) and (2) above will be used. After the three monthly reports have been consolidated into a quarterly report, the monthly reports may be destroyed. The current quarterly report and the preceding three quarterly reports will be maintained so that an analysis can be made of four consecutive quarterly reports during inspections and reviews by high commands as stated in paragraph 4-3j.

d. Copies of usage collected per c above will be submitted as part of the justification when requesting additions of similar items to the TDA by memorandum or emergency request.

4-6. Walk-through usage review procedures

a. An equipment walk-through usage review will be used by an activity to identify unused or seldom used equipment, especially when equipment usage cannot be determined or measured by established usage standards (days, hours, or miles). These procedures will be used to manage equipment listed in appendix G, with an acquisition cost of less than \$2,000 and to evaluate locally established standards. It is essential that walk-through usage reviews be comprehensive to assure that the purpose and policies of this chapter are met.

b. The purpose of a walk-through is to assist the commander in evaluating the efficient usage of all authorized equipment. Effective walk-through will enable the commander to pool underused equipment and to turn in equipment that is excess to the organization's mission needs.

c. Documented walk-throughs will be conducted by the commander and the equipment manager at least semiannually in shops, laboratories, and offices. Unannounced, documented walk-throughs will also be conducted by the equipment manager on a continuing basis, at least monthly, to identify equipment that is underused and to plan the commander's walk-through. The commander and the equipment manager should not delegate this responsibility to a subordinate.

(1) The equipment manager's walk-through will be planned to assure that all activities using equipment will be reviewed prior to each commander's walk-through.

This will enable the equipment manager to plan the commander's walk-throughs so that the commander's time is used most effectively.

(2) The equipment manager's walk-through should encompass all features of the Equipment Usage Management Program. Equipment density lists, usage reports, and hand receipts, as a minimum, should be consulted prior to and used with each walk-through.

(3) The commander's walk-through should be well planned to provide for review of all problem areas observed during the equipment manager's walk-through. As a means of furnishing contrast, exceptional areas should also be included.

d. The walk-through usage review will include, as a minimum, the following observations:

(1) Is equipment being properly used?

(2) Is there duplication of equipment?

(3) Is equipment being maintained to minimize downtime?

(4) Are functions using like equipment consolidated to the extent possible?

(5) Is calibration of equipment current?

(6) Is equipment that is in standby storage or otherwise not currently in use still required? Is it properly identified, reported as necessary, and adequately maintained?

(7) Is excess equipment removed from the work area and in the process of turn in?

(8) What actions were taken on the recommendations of previous walk-throughs?

e. The equipment manager will monitor the walk-through program and aid those supervisors requiring assistance in proper techniques of conducting walk-throughs.

f. Each walk-through will result in a report that identifies the scope of the review and includes pertinent observations and recommendations. Report distribution and necessary follow-up actions will be filed with the report and will be retained for a period of 24 months after the final actions are completed. Justification for retention of underused equipment identified as a result of walk-throughs will be documented as for all other underused equipment. The report will include the following as a minimum:

(1) Name and position or title of the person(s) conducting the walk-through.

(2) Identification of items of equipment excessed or pooled as a result of the walk-through.

(3) Approximate number of items reviewed.

(4) Recommendations and remarks.

(5) Directed actions.

4-7. Command supplement implementation

Included in the detailed implementing instructions in the command supplement to this regulation will be the MACOM or appropriate HQDA agency-approved job-peculiar equipment list with usage or retention standards pertaining thereto for the job-peculiar equipment located at installations or activities within the MACOM or FOA. The

standards will be established after considering such factors as the need for these items of equipment, the specific function they support; alternative methods, and economic feasibility and benefits of labor saving equipment; impact of not having the equipment versus cost of ownership; and so forth. The command list will include the specific identity of each item placed in the job-peculiar equipment category and will include an explanation why other items of equipment on hand cannot accomplish the mission. Used items of equipment required for future programs may be justified by identifying the program and its scheduled starting date. Decisions to retain an item of equipment for more than 1 year, pending use in a scheduled program, should be based on consideration of such factors as number of like or similar items of equipment on hand; present and future status of the end items within the Army systems; possible substitution of a more common item that would serve the same purpose; or whether the item can be used in other programs thereby improving usage.

Chapter 5 Common Tables of Allowances

5-1. General

a. A CTA is a document which authorizes items of materiel costing less than \$5,000 which are required for Army-wide use. Required for Army-wide use is defined as required by a large number of like MTOE or TDA units or their organizational elements, facilities, activities or individuals (except items in CTA 50-909, chapter 29, which are one of a kind for ceremonial units.)

b. The purpose of the CTA is to authorize widely used items of relatively low value in one document rather than documenting the items separately in each MTOE, TDA, or JTA; therefore, items authorized by a CTA will not be further documented in a TOE, MTOE, TDA, or JTA.

c. CTAs authorize materiel to the Active Army, Army Reserve, Army National Guard, Army Reserve Officers' Training Corps, and to Department of the Army Civilians. Authorization for Department of the Army Civilians also pertains to non-U.S. citizens when employed as civilians by the U.S. Army, if the basis of issue for the item applies to the duty of the individual.

d. A CTA item can be authorized for various purposes. For example, its use may be based on individuals, vehicles, weapons, locations, activities, a specific MOS or duty that the individual performs, a specific purpose or when certain conditions prevail. It is an item that does not require centralized computation of requirements in the Structure and Composition System (SACS); it must meet the criteria in paragraph 2-12.

e. CTA items are confined to—

(1) Army stock funded items, adopted and nonadopted.

Proposed
DA Form 2028 Changes
to
AR 71-13

Item	Page	Para.	Line
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1	35	4-1	6
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CHANGE: Delete "Usage standards . . ." to end of paragraph, and replace with: "The purpose of this chapter is to prescribe an overall Army Equipment Usage Management Program."

REASON: Army-wide equipment usage standards are not supportable in a modern manufacturing or support shop environment. There are too many variables.

2	35	4-3d	
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CHANGE: Delete paragraph 4-3d and replace with the following:

d. *Government-furnished property.* Usage of GFP by contractor activities will be governed by the FAR, the DFARS, and the AFARS. IAW FAR 45.509-2, contractors will accumulate data to provide visibility of the extent and manner of use of all Government-owned property. Although contractor utilization control systems will vary in type and complexity, each type will provide certain basic management data and they must be documented in writing.

REASON: The existing paragraph states that contracts will include AR 71-13 requirements in the performance work statement (scope of work) sections. Per paragraph 4-2 of AR 71-13, Chapter 4 does not apply to contracts, and paragraph 4-3 itself is a list of exemptions. Further, the statement is meaningless in that contracting officers do not use AR's when writing contracts. They use the FAR and its supplements; any Army requirements statements in addition to FAR 45-509-2 would have to be made in the AFARS to have any effect.

3 36 4-3g

CHANGE: Delete paragraph (and Industrial Plant Equipment (IPE) from the list of exemptions).

REASON: Utilization data and utilization control of IPE is very important for good production and support shop management. Items of IPE are basically machine tools costing \$15,000 or more, and may be the most important items of capital equipment in a production/shop facility. They should have utilization data collected if anything does. However, the data should be used for management and engineering studies to improve performance and quality as opposed to being used as criteria to automatically excess equipment.

4 36 4-3h

CHANGE: Delete paragraph (and RDTE equipment from the list of exemptions).

REASON: RTDE equipment should be included in equipment utilization plans just like any other type of Plant or Installation Equipment. The proposed plans are general enough to easily accomodate RDTE equipment. This would help to insure optimum use and efficient management of the equipment--the objective of Chapter 4. In addition, AMCR 700-64, paragraph 1-6f(5), states that PMs for research, development, and test projects should provide equipment managers copies of equipment lists of each project for verification of equipment requisitioning, accountability, and utilization. Also, the deleted paragraph 4-3h required that utilization walk throughs be done for RDTE equipment. It seems that existing utilization procedures did not really exempt RDTE equipment.

5 36 4-3i

CHANGE: Renumber paragraph and change to read:

g. *Army Reserve Plant (ARP) and Plant Equipment Package (PEP) equipment.* Mobilization lay-away equipment in approved PEPs (COCOs) and ARPs (GOCOs and GOGOs) does not require utilization data collection as long as it remains inactive. If removed from the ARP or PEP or from lay-away status and used, then utilization data collection is required.

REASON: Draft AR 700-90 authorizes lay-away equipment at GOCOs and GOGOs under the concept of ARPs instead of PEPs. PEPs only apply to COCO equipment per the draft.

6 36 4-3j

CHANGE: Delete paragraph 4-3j.

REASON: One-of-a-kind equipment should not be exempt from the equipment usage management provisions of Chapter 4 just because it is one of a kind. Utilization data could still be needed for management and engineering studies to improve performance and quality if not to obtain optimum use and efficient management. In addition, the data could be used for studies regarding interservice or commercial support and equipment rentals, leases, or loans.

7 36 4-3k
 4-3l
 4-3m

CHANGE: Renumber paragraph 4-3k as 4-3h, 4-3l as 4-3i, and 4-3m as 4-3j.

REASON: Old paragraphs 4-3g, 4-3h, and 4-3j deleted.

8 36 4-3m 9

CHANGE: Delete "as stated in para. 4-3j."

REASON: Old paragraph 4-3j is to be eliminated.

9 36 4-4g

CHANGE: Insert an new paragraph 4-4g as follows:

g. Installations and activities will prepare and follow approved Equipment Utilization Management Plans. The plans will apply to Plant Equipment--including Industrial Plant Equipment (IPE), Other Plant Equipment (OPE), TMDE, equipment purchased with RDTE funds, construction equipment, and materials handling equipment--and will:

(1) Establish minimum levels of use below which an analysis of need will be made and retention justified, except for inactive plants and equipment retained for mobilization. The level of use may be established for individual items or families of items, depending upon circumstances of use.

(2) Provide for recording actual use consistent with the established use levels.

(3) Require periodic analysis of need, based upon known requirements.

(4) Provide for prompt redistribution of all equipment not justified for retention.

REASON: To put Army usage management in line with FAR 45.509-2 and accepted business and engineering practice.

10 36 4-4g 1 & 3

CHANGE: Renumber paragraph 4-4g as 4-4h, and delete the words "usage standards" and replace with "minimum levels of use".

REASONS: New paragraph 4-4g added, and new terminology.

11 36 4-4h

CHANGE: Renumber paragraph 4-4h as 4-4i.

REASON: New paragraph 4-4g added.

12 36 4-4i

CHANGE: Delete paragraph 4-4i.

REASON: The support equipment listed in Appendix G is really Plant Equipment or IPE, depending on acquisition cost. In addition, Appendix G is to be deleted (see item 21 below).

13 36 4-4k

CHANGE: Delete paragraph 4-4k.

REASON: The policy/procedures are to be covered in new paragraph 4-5.

14 36 4-4l

CHANGE: Renumber paragraph 4-4l as 4-4k.

REASON: Paragraph 4-4k deleted.

15 36 4-4l 6

CHANGE: Change sentence to read "This equipment will be monitored by inspection and review."

REASON: Paragraph 4-3j is to be deleted.

16 36 4-4m

CHANGE: Delete paragraph 4-4m.

REASON: Appendix G is to be deleted, because it is obsolete.

17 36 4-4n

CHANGE: Delete paragraph 4-4n.

REASON: Appendix G is to be deleted, because it is obsolete.

18 36 4-5

CHANGE: Delete paragraph 4-5 in its entirety and replace with the following:

4-5. Procedures for Equipment Utilization Management Plans

a. MACOMs will conduct periodic utilization surveys to insure that subordinate installations and activities have adequate written procedures for controlling Plant Equipment utilization

and to approve or disapprove the procedures. The procedures should primarily encompass equipment with an acquisition cost of \$15,000, including IPE, OPE, TMDE, equipment purchased with RDTE funds, construction and engineering equipment, and materials handling equipment. The procedures should provide for the following as a minimum:

(1) Establishment of Minimum Levels of Utilization (MLUs) for equipment that take into account maintenance, production, and other workload requirements, workload forecasts, special setups and operations, surge and mobilization requirements, open capacity, and other factors.

(2) A method for collecting, reporting, and evaluating utilization data.

(3) At least annual reviews to justify retention of equipment or to declare equipment excess when it falls below the established minimum level of utilization.

b. Equipment utilization control systems can vary considerably among installations, depots, arsenals, laboratories, and proving grounds. However, a properly designed utilization control system will be compatible with other management information systems or production control systems used at the particular location. The following are five examples of an acceptable equipment utilization system, any one of which or combination could be acceptable for a given set of conditions:

(1) Utilization determined by statistical sampling.

(2) Actual measurement by meters, timers, and counters. This method is most applicable to Industrial Plant Equipment having a high dollar value (\$25,000) and will normally supplement other techniques.

(3) Manual or mechanical reporting in conjunction with normal manufacturing production control system(s). These are two of the more comprehensive methods for

collecting and reporting utilization of machine tools. Data can be derived from and processed with the normal planning, scheduling, and reporting of manufacturing related to work orders.

(4) Group identification. This method involves identifying as a unit either all of a particular type of equipment (engaged in similar operations) or all equipment engaged in one operation (items in a line may be of different types).

(5) Individual item identification. Equipment items may be of such a nature that usage is infrequent due to the fact that the equipment is acquired for specific specialized operation or function. In such a case, the facts should be documented and the retention justified based on the special nature of the operation or function.

c. Utilization control of OPE or other items with an acquisition cost of less than \$15,000 will generally not be as detailed or sophisticated. Such systems basically require only sampling verification of need or use and quantity of items. Minimum controls should be kept with a review at least on an annual intervals, depending upon stability of workload and other pertinent local conditions. Identifying equipment to an operation, station, building, function, shop, work area, tool crib, or machine is a technique that can be used for such items as Plant Equipment, support equipment, and other similar items generally valued at less than \$15,000. Also to be considered are those items of equipment where usage is usually infrequent due to the fact that the equipment is acquired for a specific, specialized operation.

REASON: To put Army usage management in line with FAR 45.509-2 and accepted business and engineering practice.

19 37 4-6a 5 & 6

CHANGE: Change the end of the sentence to read "by established MLUs."

REASON: New terminology.

20 37 4-6a 8 & 9

CHANGE: Delete the phrase "listed in appendix G, with an acquisition cost of less than \$2,000".

REASON: Appendix G is to be eliminated.

21 286

CHANGE: Delete Appendix G, Equipment Usage Standards.

REASON: The concept of generic equipment usage standards is obsolete, they are not supportable in a modern manufacturing or support shop environment. There are too many variables.